

Unit 4 – Atomic Theory (Ch. 6) and Compounds (Ch. 7).**Chapter 6.1 – Properties Are Used to Identify Matter**

1. What is the difference between physical and chemical properties?
2. _____ are formed when two or more substances are put together, but are not chemically combined.
3. Pure substances are made up of only one kind of _____. There are two types of pure substances: _____ and _____.
4. Elements cannot be chemically _____ into simpler substances.
5. Compounds are pure substances that are made up of _____ atoms combined in a particular way.
6. The smallest particle of any element is an _____.
7. List 9 elements that are not found as single atoms.

Chapter 6.2 – Atomic Theory

1. Subatomic particles are the particles that make up an atom. The three subatomic particles found in atoms are: _____, _____, and _____.
2. Describe a proton's charge, location in the atom, relative mass, symbol, and volume it occupies in the atom.

3. Describe a neutron's charge, location in the atom, relative mass, symbol, and volume it occupies in the atom.

4. Describe an electron's charge, location in the atom, relative mass, symbol, and volume it occupies in the atom.

5. Neutral atoms have no overall charge, meaning the amount of _____ (with a +1 charge each) and the number of _____ (with a -1 charge each) must be _____.
6. Since electrons are only found _____ the nucleus, and neutrons contribute no charge, the nuclear charge (charge of the nucleus) is simply _____ to the number of _____.
7. The number of protons is not only equal to the nuclear charge but also the _____ number.
8. What are mass number and atomic mass? How do they differ?

9. The atomic number always identifies the element being discussed. Find the elements with the following atomic numbers:
 - a. Atomic # 18 = _____
 - b. Atomic # 4 = _____
 - c. Atomic # 27 = _____
 - d. Atomic # 82 = _____

10. Find the atomic number and number of protons of the following elements:

- a. Carbon is Atomic # _____ and has _____
- b. Iron is Atomic # _____ and has _____
- c. Gold is Atomic # _____ and has _____
- d. Calcium is Atomic # _____ and has _____

11. The atomic number _____ as you move left to right across the periodic table.

12. Electrons are found in _____ around the _____ of an atom or ion. The first _____ can hold up to _____ electrons, and the second _____ can hold up to _____ electrons.

13. A Bohr diagram shows how many _____ are in each shell surrounding the _____. They also show the number of _____ in the nucleus.

14. Elements in period 1 have _____ electron shell with a maximum of two _____ in the shell. Elements in period 2 have _____ electron shells with a maximum of eight electrons in the outer shell.

15. Atoms in group _____ all have filled outer electron shells. This is one of the reasons they are stable and _____ elements.

16. Single electrons in shells are called _____, and two electrons together are called _____.

17. Draw a Bohr diagram for the following neutral atoms and state how many valence electrons each has.

a. Nitrogen

b. Neon

c. Hydrogen

Chapter 6.3 – Classifying Elements with the Periodic Table

1. Groups of elements that have characteristic sets of _____ physical and chemical properties are referred to as _____.
2. Provide two properties and two example elements in each of the following chemical families:
 - a. Alkali metals (group 1)
 - b. Halogens (group 17)
 - c. Noble gases (group 18)
3. Metals are found on the _____ side of the periodic table, while the non-metals are found on the _____ side of the table. Metalloids (having properties of both metals and non-metals) form a staircase toward the _____ side of the periodic table.
4. The elements found between groups 3 to 12 are called _____ metals.
5. Group 1 elements have _____ electron in their outermost shell, group 2 elements have _____ electrons in their outermost shell, almost all group 3 elements have _____ electrons in their outermost shell and group 18 elements have _____ electrons in their outermost shell.
6. What are some things that a periodic table may display about each element?

Chapter 7.1 – Compounds, Atoms, and Ions

1. Atoms that gain or _____ electrons become electrically charged and are called _____. Atoms have a tendency to _____ due to their arrangement of electrons. _____ and _____ are not involved in the bonding process.

2. The outer most shell is called the _____ and electrons in the outermost shell are called _____. The electrons in the outer most shell are the electrons that are involved in _____. Elements that are within the same group have the _____ of _____.
3. Elements have a tendency to have outer electron shells that are _____.
4. The symbol of each element's ion is represented by the element's symbol with the _____ superscripted.

Chapter 7.2 – Chemical Bonding

1. Compounds are formed with _____ or _____ bonds. Ionic compounds are generally made up of a _____ and a _____, while covalent compounds are generally made up of two _____.
2. Ionic bonds contain a positively charged _____ and a negatively charged _____. In ionic bonding one or more electrons transfers from each _____ atom to each _____ atom.
3. To show that a metal or a non-metal is charged (an ion) in a Bohr diagram you place large square _____ around the diagram with the _____ shown on the outside.
4. What are some properties of ionic compounds?
5. Molecular bonding involves the sharing of _____ between two non-metals.
6. Draw the Bohr diagram for sodium chloride (NaCl). Note: NaCl is made up of one sodium ion with a 1+ charge and one chlorine ion with a 1- charge.
7. Explain why sodium chloride is a stable compound based on the Bohr diagram you made in question 6.

8. Draw the Bohr diagram for water (H_2O).
9. A _____ molecule is a pair of atoms (of the same element) that are joined by covalent bonds.
10. List seven elements that form diatomic molecules.
11. What are some properties of molecular compounds?

Chapter 7.3 – Ionic Compounds: Chemical Formulas and Naming

1. A chemical formula describes the _____ of the compound elements.
2. The rule when balancing a chemical formula for any _____ is that the total ion charge for the compound is _____.
3. The simplest ionic compounds contain only _____ types of _____ ions.
4. The name for an _____ has two parts to it. The name of the _____ comes first and the name of the _____ comes second. The name of the _____ is always the full name as on the periodic table and the name of the _____ is the full name as on the periodic table except it ends with the suffix _____.
5. The chemical formula of an ionic compound shows the _____ of each element in the compound. For example, Na_2O contain _____ sodium ions for every _____ oxygen ion.
6. A _____ a type of chemical compound that contains a _____ chemically combined with _____.

7. Write the names of the following ionic compounds.

- a. NaCl = _____
- b. AlBr₃ = _____
- c. KI = _____
- d. MgO = _____
- e. Ca₃N₂ = _____

8. The opposite of writing a name from a chemical formula would be writing the chemical formula of a compound from its chemical name. The first step in writing the formula for an ionic compound is to identify the ion _____ of each ion. For example in the compound potassium sulphide, potassium has a _____ charge and sulphur has a _____ charge. That means you need _____ potassium ions for every _____ sulphur ion.

9. Write the chemical formula of the following ionic compounds.

- a. sodium fluoride = _____
- b. lithium phosphide = _____
- c. cesium oxide = _____
- d. beryllium nitride = _____
- e. barium iodide = _____

10. Metal ions that are formed from the first two groups, the alkali metals and _____, form _____ and _____ charges respectively. There are other metals that can form more than one type of ion charge. These metals are termed _____. For example, if you look up iron on the periodic table, it shows that _____ and _____ are the common charges that iron forms when in an ionic compound.

11. To indicate the charge of a multivalent ion when name an ionic compound containing a multivalent ion, we use _____ to denote the _____.

12. Fe(III) implies that the iron ion has _____ charge, while Fe(II) implies the charge is _____.

13. Write the names of the following ionic compounds containing a multivalent metal.

- a. iron (II) fluoride = _____
- b. gold (I) oxide = _____
- c. cobalt (III) nitride = _____
- d. manganese (IV) iodide = _____
- e. tin (II) sulphide = _____

14. When writing the chemical formula of an ionic compound containing a multivalent metal, you first need to identify the charge of the _____ ion in the compound. If the compound is FeCl₃, the charge is _____ for each chlorine ion, which means the chlorine ions contribute an

overall _____ charge to the compound as there are three _____ in the compound. If the chlorine ions contribute _____ charge, then the iron ion(s) must contribute _____ charge as the ionic compound overall must be _____.

15. Write the chemical formula of the following ionic compounds containing a multivalent metal.

- a. CoCl_2 = _____
- b. Fe_2S_3 = _____
- c. HgO = _____
- d. UCl_6 = _____
- e. Sn_3P_4 = _____

16. A _____ ion is an ion composed of more than one type of atom _____ by covalent bonds. These types of ions _____ their own since they carry an _____. Common polyatomic ions can be found in your data booklet or on p. 192 of your textbook.

17. When writing the name of an ionic compound containing polyatomic ions, you write the full name of the _____ ion and the _____ name of the polyatomic ion as found on the polyatomic ion chart. A common positively charged polyatomic ion is _____.

18. Write the name of the following ionic compounds containing polyatomic ions.

- a. $\text{Ca}(\text{NO})_2$ = _____
- b. Na_2SO_4 = _____
- c. $\text{Fe}(\text{OH})_2$ = _____
- d. $(\text{NH}_4)_3\text{PO}_4$ = _____
- e. $\text{Sn}(\text{Cr}_2\text{O}_7)_2$ = _____

19. Write the formula of the following ionic compounds containing polyatomic ions.

- a. sodium phosphite = _____
- b. gold (I) carbonate = _____
- c. calcium perchlorate = _____
- d. ammonium oxide = _____
- e. lead (IV) acetate = _____

Chapter 7.4 – Molecular Compounds: Chemical Formulas and Naming

1. A _____ contains two non-metal elements joined together by one or more covalent compounds. We use _____ to identify how many of each atom is present of each type of element. For example, we use _____ to represent one atom, _____ to represent two atoms and _____ to represent three atoms.

2. When there is only one atom of the first element listed, we do not use a _____. Similar to naming ionic compounds, the _____ listed is written in _____ and the second element is written in full with the suffix _____ instead.

3. Write the names of the following covalent compounds.

- a. CO_2 = _____
- b. N_2O = _____
- c. P_4O_{10} = _____
- d. PCl_5 = _____
- e. N_2O_4 = _____

4. Write the chemical formula of the following covalent compounds.

- a. nitrogen trifluoride = _____
- b. dinitrogen tetrasulphide = _____
- c. phosphorus pentabromide = _____
- d. xenon hexafluoride = _____
- e. carbon monoxide = _____

5. Write the names of the following compounds.

- a. SO_2 = _____
- b. NaNO_3 = _____
- c. PbO = _____
- d. PCl_3 = _____
- e. $(\text{NH}_4)\text{Cl}$ = _____

6. Write the formula of the following compounds.

- a. sodium sulphate = _____
- b. carbon tetrabromide = _____
- c. Gold (III) iodide = _____
- d. ammonium sulphide = _____
- e. diiodide hexachloride = _____

Vocabulary to Know

Write a concise definition of each of these terms found in this chapter.

Atom –

Atomic mass –

Atomic number –

Bond –

Chemical bonds –

Chemical families –

Chemical formula –

Chemical property –

Compound –

Covalent bonding –

Diatomic molecules –

Electron –

Electron shell –

Element –

Ion –

Ionic bonding –

Ionic compounds –

Mass number –

Mixture –

Molecular compounds –

Molecule –

Multivalent –

Neutron –

Nucleus –

Physical property –

Polyatomic ion –

Proton –

Pure substance –

Valence electrons –

Valence shell –